CLAIMS

1. An electrode apparatus for the application of electric fields to a selected portion of a living body, comprising:

a support member;

an array of electrodes mounted on said support member in spaced relation to one another, at least one of said electrodes having a needle configuration for penetrating tissue for *in vivo* electroporation of cells of the tissue; and

an electric pulse generator applying pulses of high amplitude electric signal to the electrodes proportionate to the distance between opposing ends of said electrodes.

2. An apparatus according to Claim 1 wherein said needle electrode having a cannula for the introduction of molecules into said tissue.

3. An apparatus according to Claim 2 wherein said array of electrodes comprises a central electrode of a first polarity and a plurality of electrodes of a second polarity encircling said central electrode.

4. An apparatus according to Claim 3 wherein said support member comprises a central tubular shaft, and said central electrode is adjustably mounted in said shaft and

adjustably extendable from said shaft selectable lengths for selectable depths of penetration into tissue.

5. A method according to Claim 1 wherein said support member comprises a collar mounted on said shaft and said circular array of needles are supported on said collar assembly comprises guide means supporting said electrodes for movement toward and away from one another, a rotating screw on said support member operatively connected for moving said electrodes, a manually operable wheel for rotating said screw and said means for sensing is a rheostat drivingly connected for rotating with said screw.

6. A method according to Claim 1 wherein said array of electrodes comprises a circular array of needle electrodes, and a switch assembly for selectively changing the polarity of opposing ones of said electrodes. The electric signal has a wave form selected from the group consisting of an exponentially decaying pulse, a square pulse, a unipolar oscillating pulse train and a bipolar oscillating pulse train.

7. A method according to Claim 6 wherein said switch assembly includes a rotary switch selectively positionable for connecting alternate opposite pairs of electrodes to said pulse generator. At least one of said needle electrodes has a cannula for injecting molecules into said tissue, wherein the electric field has a strength of between approximately 0.2 kV/cm and 20.0 kV/cm.

8. A method according to Claim 7 wherein each pulse has a duration of between approximately ten microseconds and one hundred milliseconds.

9. A method according to Claim 7 wherein the field applies between approximately one pulse and one hundred pulses to a given unit of liquid volume as the unit passes through the preselected location in the blood vessel.

10. A method according to Claim 1 wherein the preselected cells are lymphocytes, the electric field has a strength of approximately 0.55 kV/cm and the signal has a pulse train wave form that decays exponentially with a pulse duration of approximately fifty to fifty-five milliseconds.

11. A method according to Claim 1 wherein the electric signal has a wave form selected from the group consisting of an exponentially decaying pulse, a square pulse, a unipolar oscillating pulse train and a bipolar oscillating pulse train.

12. A method according to Claim 1 wherein the electric field has a strength of between approximately 0.2 kV/cm and 20.0 kV/cm.

13. A method according to Claim 7 wherein each pulse has a duration of between approximately ten microseconds and one hundred milliseconds.

14. A method according to Claim 7 wherein the field applies between approximately one pulse and one hundred pulses to a given unit of liquid volume as the unit passes through the preselected location in the blood vessel.

15. A method according to Claim 1 wherein the preselected cells are lymphocytes, the electric field has a strength of approximately 0.55 kV/cm and the signal has a pulse train wave form that decays exponentially with a pulse duration of approximately fifty to fifty-five milliseconds.

16. A method for the therapeutic application of electroporation to a portion of the body of a patient for introducing molecules into cells therein, comprising:

providing electrode means including adjustably spaced electrodes for generating an electric field at a preselected location within a body of a patient;

sensing the distance between said electrodes and generating a signal proportionate to the distance between said electrodes; and

providing an electric pulse generator connected to said electrode means operating said pulse generator for applying an electric signal to said electrodes proportionate to the distance between said electrodes for causing said electrodes to repeatedly generate electric fields of a

predetermined amplitude and duration thereby forcing the walls of preselected cells in the body portion to be transiently permeable for permitting the molecules to enter said preselected cells.

17. An apparatus according to Claim 11 wherein the electrode means are selected to comprise forceps having moveable clamping jaws defined by said spaced electrodes.

18. An apparatus according to Claim 12 wherein the forceps are insertable through a tube.

19. An apparatus according to Claim 13 wherein said forceps are selected to comprise a central shaft portion, said clamping jaws on one end of said shaft portion, a handle with actuating means on the other end, and said means for sensing the distance between said electrodes includes means for sensing the relative position of said actuating means.

20. A method according to Claim 11 wherein said electrode assembly is selected to comprises guide means supporting said electrodes for movement toward and away from one another, a rotating screw on said support member operatively connected for moving said electrodes, a manually operable wheel for rotating said screw and said means for sensing is a rheostat drivingly connected for rotating with said screw.

21. An apparatus according to Claim 15 wherein said pulse generator is operated for generating an electric field having a strength of between approximately 0.2 kV/cm and 20 kV/cm.

22. An apparatus according to Claim 16 wherein said pulse generator is elected to generate an electric signal having a wave form selected from the group consisting of an exponentially decaying pulse, a square pulse, a unipolar oscillating pulse train and a bipolar oscillating pulse train.

23. An apparatus according to Claim 11 wherein said electrode means is selected to comprise a first plurality of needles mounted in a first clamp fixed on said holder and a second plurality of needles mounted in a second clamp movably mounted on said holder.

24. A method according to Claim 18 wherein the electric signal has a wave form selected from the group consisting of an exponentially decaying pulse, a square pulse, a unipolar oscillating pulse train and a bipolar oscillating pulse train.

25. A method according to Claim 19 wherein the electric field has a strength of between approximately 0.2 kV/cm and 20.0 kV/cm.

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